

Chapter III. Hazard Evaluation and Risk Assessment

Methodology

Research to develop the historic occurrences of natural disasters in Carbon County was conducted using a number of sources. Over 25 long-time residents from all over the county were contacted and interviewed about their recollections. These recollections were then cross-referenced with early newspaper accounts found in the Carbon County Journal, the Carbon County News, the Joliet Journal, and the Bridger Times. The Carbon County Historical Society and Museum archive files of significant events were checked.

It must be pointed out that the long-time residents of Carbon County are quite hardy and resourceful. This hardiness was evidenced during the numerous interviews which yielded little in the way of substantive information. Despite the fact that there have been many small-scale and some larger disasters recorded in the county, most of those interviewed were unable to recall incidents which they would classify as disasters. Major winter storms, floods, and drought were simply considered events that one should routinely expect and respond to with the resources at hand and a minimum of agitation and excitement.

State and federal data bases were searched for weather, earthquake, volcano, avalanche and other information. And, finally, local experts at the Montana Department of Transportation, the Deputy State Fire Warden, Montana Bureau of Mines and Geology, the National Weather Service, Natural Resources Conservation Service, the Gallatin National Forest Avalanche Center, the Custer National Forest, Bureau of Land Management, and other local, state, and federal agencies were contacted and interviewed.

The following hazard profiles cover all natural hazards identified at the first Steering Committee/Public meeting regardless of the priority they were assigned. The potential loss estimates at the end of this chapter were generated only for the top priority hazards, addressing both natural and person-related hazards.

Avalanche

An avalanche or snowslide is simply a mass of snow sliding down a mountainside. Avalanches occur when the stress of gravity exceeds the bonds of the grains in the snow cover. In order for an avalanche to occur there must be a steep slope, snow cover, a weak layer in the snow, and a trigger. Avalanche danger increases with major snowstorms and periods of thaw. Approximately 90% of avalanches start on slopes of 30-45 degrees, most often on slopes above timberline facing away from prevailing winds. Most avalanches occur in the backcountry. (Colorado Avalanche Information Center website)

Historic occurrences

The Gallatin National Forest Avalanche Center does not track historical avalanche events and no other data base could be found. Carbon County Search and Rescue periodically responds to avalanche incidents where skiers have triggered an avalanche on Beartooth Pass. The Carbon County News reported on May 3, 1973, that an avalanche knocked a youth half a mile off Vista Point on Beartooth Pass with a wall of snow eight feet high and twelve feet wide. An avalanche on the Forest Service's Hell Roaring Plateau Road in 2002 severely damaged a bridge and closed the road to vehicle traffic. Although the foundation remained in place, the decking was swept down drainage. The bridge was replaced in 2005 for a contracted amount of \$24,430 that included removal of the old decking and replacement of the superstructure and signing. (B.Christiansen, Custer National Forest Engineering) The SHELDS data base has no recorded entries for avalanches in Carbon County between January 1, 1960 and December 31, 2003.

Vulnerability

Carbon County is vulnerable to avalanches, however, most winters the vulnerability is limited to several areas of the county, specifically the higher elevation public lands in the southwest. During the winter and spring months, individual and small groups of recreational skiers and snowmobile riders are exposed to avalanche danger primarily up the Lake and West Forks of Rock Creek, on areas accessed from the Beartooth Highway, and on areas out of bounds of the Red Lodge Mountain ski area. Montana Department of Transportation employees who clear snow from the road in the spring are also exposed to avalanche danger. Avalanches do occur along the Beartooth Highway, but the highway is closed to the public during these periods. Most of the avalanches that release in the county do not affect people and none of the communities in the county are situated in avalanche paths.

Dam Failure

Dams are rated as high, significant, and low hazard. Hazard determinations are based upon the consequences of dam failure, not the condition, probability, or risk of failure.

The following five criteria determine if a dam is classified as high hazard in Montana.

- 1) The impoundment capacity is 50 acre-feet or greater and it is determined that a loss of human life is likely to occur within the breach flooded area as a result of the failure of the dam.
- 2) The breach flooded area is the flooded area caused by a breach of the dam with the reservoir full to the crest of the emergency spillway.

- 3) The evaluation of the effects of flood inundation will continue downstream until the flood stage is equal to that of the 100-year floodplain.
- 4) The breach flow hydrograph and downstream routing of the breach flows will be estimated either by visual determination of dam breach modeling techniques.
- 5) Loss of life is assumed to occur if the following structures are present or planned for as a matter of public record or notice in the breach flooded area: occupied houses and farm buildings, stores, gas stations, parks, golf courses, stadiums, ballparks, interstate, principal, and other paved highways, and including railroads, highway rest areas, RV areas, developed campgrounds; and excluding unpaved county roads and all private roads.

According to the Montana Dam Safety Bureau there are a total of 12 dams in Carbon County. Of these, 10 are privately-owned and two are state-owned. All of the private dams are low hazard, no dams are significant hazard, and the two state-owned dams, Glacier Lake and Cooney Reservoir, are high hazard. Emergency Operations Plans have been prepared by the Department of Natural Resources and Conservation for Glacier Lake and Cooney Reservoir. These plans are current and are housed in the Disaster Emergency Coordination office.

Failure of the Mystic Lake Dam regulated by the Federal Energy Regulatory Commission and located in neighboring Stillwater County has the potential to flood a very small portion of the western edge of Carbon County. If the dam were to fail, no structures in Carbon County would be affected. Mystic Lake Dam is a high hazard dam.

Historic occurrences

There have been no major dam failures in Carbon County. During the spring of 2005, a major precipitation and runoff event created a full pool at Cooney Reservoir. The emergency spillway was utilized and no damage occurred.

Vulnerability

Given that the two high hazard dams in the county are regulated by the state, and there is a very low probability of a major earthquake in the county, the vulnerability of Carbon County to a dam failure in the county is low. Areas vulnerable are downstream of Cooney Dam along Red Lodge and Rock Creeks (Joliet), and downstream of Glacier Lake Dam on Rock Creek (Red Lodge.) If one of these two dams were to fail, structures downstream would be affected.

Drought

Annual precipitation varies greatly across Carbon County for any given year averaging greater than 80 to less than 6 inches. The eastern and southern portions of the county are some of the driest areas in the state of Montana. It is not uncommon for temperatures to reach the low 100's in these same dry areas during July and August.

Dryland and irrigated farming and livestock production provide important sources of income for Carbon County. The county has an extensive system of irrigation ditches that deliver water from the higher elevations across the benches to the valley bottoms and within the tilled valley bottoms. Drought and blight can have adverse effects on farm and livestock production, domestic and municipal water supplies, and wildland fire danger.

Historic occurrences

The Bridger Times reported a prediction from the State Entomologist on January 16, 1936, that Carbon County will be quite heavily infested with grasshoppers in the 1936 season. Extreme drought in the county in the early 1930's was reported during several of the personal interviews. (Melvin Brown, Belfry)

Table 3.1. Disaster Declaration (1998-2004)

<i>Designation No.</i>	<i>Date Designated</i>	<i>Type of Disaster</i>	<i>Designation Type</i>
S1269	11/24/98	Drought	Secretarial
S1354	9/22/99	Wildfire, Drought	Secretarial
S1468	1/11/01	Drought	Secretarial
S1538	5/29/01	Drought	Secretarial
S1579	11/1/01	Drought, Wildfire	Secretarial
S1624	3/27/02	Drought	Secretarial
S1645	5/31/02	Drought	Secretarial
S1951	9/7/04	Drought	Secretarial

Source: Farm Home Administration (9/04)

Neither the SHELDUS data base nor the National Climate Data Center have drought entries recorded for Carbon County.

Vulnerability

The entire county is vulnerable to both localized and wide-spread drought. Wide-spread, long-lasting drought has the potential to cause the most damage by affecting agriculture, domestic water supplies, and fire danger. Predictions in late 2004 by the National Oceanic and Atmospheric Administration's (NOAA) Climate Prediction Center were for a continuation of the existing long-term drought through at least the spring of 2005. The prediction is due to the facts that the area generally receives little moisture during the winter months and that

snowpack conditions have fallen below average. In an Associated Press story on December 22, 2004, NOAA Meteorologist, Douglas LeComte said “It’s taken a long time to get this bad and it will take a long time to get back to normal.” Drought generally does not directly affect structures.

Earthquakes

According to the U.S. Geological Survey, Montana is one of the most seismically active states in the country. However, Montana’s earthquake activity occurs primarily in the western third of the state.

Historic occurrences

The first significant quake on record that would have been felt in Carbon County was on June 27, 1925. Although centered in southwestern Montana, the quake shook locations all over the state and beyond the state boundaries in all directions. The largest quake in Montana’s history was the Hebgen Lake earthquake on August 17, 1959. The quake was a magnitude of 7.1. Shocks from the quake were felt in Carbon County and many long-time residents of the county recall the disaster. The largest earthquake swarm since 1973 occurred in the fall of 1985. More than 3,000 earthquakes struck the upper Madison Valley area. None were felt in Carbon County (Tracking Changes in Yellowstone’s Restless Volcanic System, U.S.G.S. Website). Interviews of over 25 county residents provided only one recollection of a minor quake that had occurred in the back country, caused no damage, and was never documented. The U.S. Geological Survey Seismicity of Montana from 1990-2001 has no record of any earthquakes in Carbon County. The SHELUDS data base has no recorded entries for earthquakes in Carbon County.

Vulnerability

According to Earthquake Studies Specialist, Mike Stickney at the Montana Bureau of Mines and Geology (MBMG), Carbon County is located east of the main fault line in Montana. The chances of having a major earthquake centered in Carbon County are very small. Carbon County is most likely to feel shaking as a result of an earthquake centered elsewhere if any shaking is felt at all. Damage from an earthquake although unlikely, could conceivably occur in Carbon County if a large magnitude earthquake occurred elsewhere and shook while the ground was saturated. Infrastructure and structures across the entire county would be at risk if an earthquake did occur. Impacts to structures could include structural damage, cracked foundations, and/or even collapse. The MBMG has plans to install a seismic activity monitor in the Bridger area in 2005.

Earth Movement

The term earth movement includes landslides, slumping, and subsidence. Slope; vegetative cover; soil properties; past human activities such as mining, road construction, and irrigation canal operation; and snowmelt/precipitation all affect the likelihood of earth movement. The USDA has mapped the soils in Carbon County. Soil suitability is considered by the county planning board during subdivision review on proposed developments. Earth movement has the potential for causing loss of lives and/or property.

Historic Occurrences

Land and rockslides on a very small scale have and continue to occur frequently on the Beartooth Highway. These landslides consisting primarily of rock are generally confined to small stretches of the highway and quickly removed to facilitate traffic flow. Daily freeze-thaw cycles during the spring and fall often trigger these rockslides. The SHELATUS data base has no recorded entries for Carbon County for landslides.

On Thursday, May 19, 2005, weeks of heavy wet snow and rain combined to create the conditions that lead to massive mud and rock slides along the Beartooth Highway. According to the May 26, 2005, Carbon County News story, "In the worst areas, an avalanche of mud, rocks and debris completely swept away stretches of highway, leaving guardrails and culvert pipes shredded and dangling in mid-air. On less affected sections, dirt, rocks, trees and debris blanketed the road to a depth of several feet." Department of Transportation employees were at work clearing the remaining snow for the upcoming seasonal highway opening when the slides occurred. No one was injured. On May 27, Governor, Brian Schweitzer declared Carbon County a disaster as a result of the slides. The highway remains closed indefinitely while experts assess the damage and make plans to begin repairs.

A drive around the benches and foothills of Carbon County shows ample visual evidence of past localized slumping. Slumping occurs when soils prone to movement are located on slopes which then become saturated. The saturation can occur as a result of snowmelt with or without rain, heavy rain events, and/or seepage from irrigation facilities. Soils with high clay content hold the most moisture and thus become the heaviest and most prone to sliding. The Bear Creek Hill located between Bear Creek and Red Lodge is composed of clay underlain by shale. Two major slumps have occurred on the Bear Creek Hill in the past ten years, each time necessitating extensive reconstruction and repair of Highway 308 by the Montana Department of Transportation. Localized slumps occur along the vast network of irrigation ditches and canals in the county.

A number of underground coal mines were once in production in Carbon County. The mines were located at Red Lodge, Bear Creek, and Bridger. The

underground workings have largely filled with water since the cessation of mining operations. No subsidence related to these mines has been reported.

Vulnerability

It is challenging to predict the number and frequency of earth slumping events in the county because their occurrence is so dependent on the timing and intensity of precipitation and snowmelt. (G.Hill, Natural Resources Conservation Service) However, because Carbon County has slopes and soils that will slide, slumping will occur in the future. Based upon past slides, vulnerable areas include the edges of east and west benches above Rock Creek and the Bearcreek Hill. Due to the locations of structures in relation to potentially slumping areas, it is most likely that infrastructure (highways) would be damaged rather than structures.

Landslides and rockslides will also continue to occur. The primary asset at risk from rock and landslide is the Beartooth Highway, a seasonal federal highway maintained by the state of Montana. Subsidence of the ground over historic mine workings appears unlikely because the situation seems to have stabilized over time. However, subsidence remains a possibility in locations under the heart of the city of Red Lodge, the area west of Bridger, and in the Bear Creek area.

Flood

Three types of floods are possible hazards in Carbon County, seasonal runoff river floods, ice-jam river floods, and flash-floods. Floods of all types can cause extensive damage to property, crops, and infrastructure; result in evacuations, loss of income, and injury and loss of life. Floods are natural events for rivers and streams and floodplains have historically proven attractive to development. Stretches of the 100-year floodplain have been mapped for both Rock Creek and the Clarks Fork of the Yellowstone.

Table 3.2. Flood Insurance Policy Statistics as of 12/31/2003

<i>Name</i>	<i>Policies in Force</i>	<i>Insurance In-force</i>
Carbon County	49	\$6,275,200
Fromberg	4	\$ 345,800
Joliet	4	\$ 755,000
Red Lodge	13	\$1,792,800

Source: FEMA, Flood Insurance Statistics Web Page

Historic Occurrences

County Commissioners, Steering Committee members, and long-time residents were all asked to recall flood events for the PDM project. Recollections were then checked against previous newspaper accounts in the Carbon County News, the Clarks Fork Pioneer, the Bridger Times, and the Carbon County Journal. In addition the SHELDS and Western Climate Center data bases were checked.

None of the sources were 100% complete or accurate when considered individually, nor were they all in agreement with each other. What follows is the general picture painted by all of these sources with examples of some specific flood incidents.

The first flooding related disaster appearing in the County Commission notes was in April 1917. The notes reference a bridge lost at Bridger to an ice jam. June 1918 appears to have produced the costliest flood in the history of the county. The Carbon County Journal reported on June 19, 1918 "Carbon County has been for the past week in a state of semi-isolation in so far as traffic with the outside world is concerned because of the swollen streams that have poured their waters over the lowlands." The paper went on to report that rail service failed, there had been no mail for four days, the wagon bridge over the Yellowstone at Laurel was out and the railroad bridge offered the only means to cross the river, and the floods "have caused hundreds and thousands of dollars in damages to farms and bridge and by the paralyzation of train facilities." The area just east of the community of Silesia called the Mason bottom was reportedly under three feet of water, the crops were ruined, a Burlington engine was lost in the river, and land was eaten away. Total losses from the flood in 1918 dollars were estimated at \$200,000. During the same storm, a huge channel was cut through Fromberg, several major irrigation canals were damaged, and the Montana Power Company's line broke resulting in a loss of power and subsequently loss of water because the pumps were inoperable. The Bridger Times of June 14, 1918 reported that "incalculable damage" was done from this same event where "rapidly melting snows sent record-breaking torrents, overflowing lowland, destroying irrigation ditches, and impeding transportation." "Old timers say the water this year is the highest it has been in their recollection."

A serious flash flood also occurred in 1918, in Red Lodge and Bear Creek on July 15, 1918 according to the July 17 Carbon County Journal. The deluge washed out water mains from which Bear Creek gets its drinking water, the railroad tracks were damaged, basements were flooded, garden plots were washed out, and water cut channels in the town streets. The Journal reported that "Old-time residents of this vicinity are unanimous in their verdict that it is the heaviest rain they have ever witnessed."

The next major flood occurred in 1932 along the Clarks Fork River. The Bridger Times of June 9 reported "Heavy rains of the past few days have done some damage to the roads and highways and small bridges and culverts have been washed out." After listing all of these results, however, the article goes on to say that the damage was slight. The County Commissioners' minutes on June 11, 1932, state that they passed a resolution creating an "extreme emergency" in the road and bridge budget. This occurred again in June of 1934, when rains and floods damaged roads and bridges creating an "extreme emergency."

The Bridger Times (8/13/36) reported on a flash flood. A cloudburst in the Sand Creek area, four miles west of Bridger took out a bridge, flowed over the highway, and in some places, streets were damaged. Another extreme public emergency was declared by the County Commissioners in July of 1937 due to road damage and culvert washouts.

Clarks Fork Valley resident Jim Yedlicka recalled an ice-jam flood on the Clarks Fork at Fromberg in the 1940's. Jim and his family "turned out the cattle, left the house and went to the neighbor's. The chickens were lost and so were some goods in the cellar when the jam broke overnight." Jim reported that this was the only time in his lifetime of over 50 years living along the Clarks Fork River that he had to leave his home for a natural disaster. Melvin Brown of Belfry remembered a bad flood on the Clarks Fork River shortly thereafter as a result of an ice jam in 1946. The flood caused the family to move their livestock to safety.

On February 19, 1948, "Sudden Warming of Weather Causes Excessive Runoff" was the headline in the Bridger Times. The paper went on to report that ice jams had formed on the Clarks Fork around the bridge leading to East Bridger forcing surface water over the lowlands. Several thousand dollars of stock were lost and there was much property damage. Many farms were covered by water and the bridge was almost lost. "Warm sun, snowmelt, and water in the ditch west of Main Street was frozen, so runoff began to pour in Bridger Streets." Fortunately this was a short-lived incident with the water receding the following day.

In 1967, a flash flood between Luther and Red Lodge blew out a large culvert as a result of five inches of rain in one storm. A D-4 cat and homestead barn were lost in the flood. (Carl Hansen, Joliet) The Carbon County News reported that eleven consecutive days of rain caused the flash flood that did considerable damage to farms below the highway. Traffic was detoured through Luther. Chickens, a calf, a shed, and farm implements were carried away.

Reuben Steinmetz of the Joliet area reported a spring flood in Joliet in 1967 due to a combination of heavy snow and warm rain that washed out ditch head gates. The same combination of events produced flooding in the City of Red Lodge according to Public Works Director, Orval Boyer.

A flood west of Red Lodge brought down power and phone lines, roads and bridges were washed out and a number of ranch families were stranded according to the Carbon County News on May 15, 1975. "It's going to be real expensive to put the county back in shape. We'll do it ourselves. And we'll get it done" was the reaction of then County Commissioner, Frank Cole.

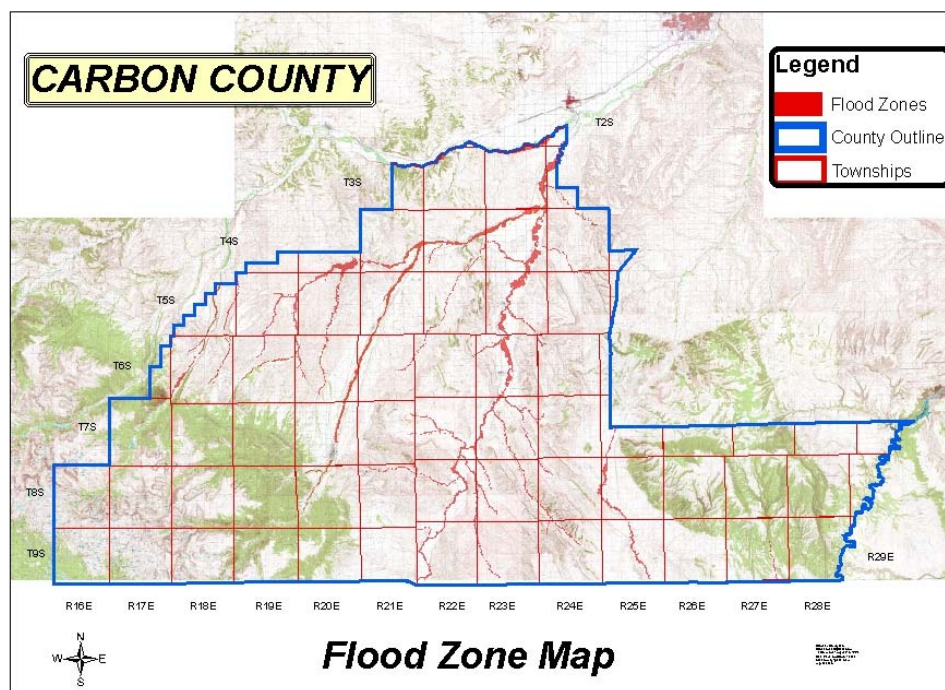
In 1981, the Carbon County News (6/11/81) reported torrential rains in May. The Bear Creek hill slid and the Clark Fork roared out of its banks threatened bridges, flooded roads, damaged irrigation intakes, and imperiled two homes. Norm

Dewell, the first Disaster and Emergency Coordinator for Carbon County recalled a springtime flood on the Clarks Fork in the late 1980's.

The County Commissioners' minutes for February 1996, make mention of probable emergency road closures due to ice jams in the Rockvale area. The ice jams in the Rockvale-Silesia area are mentioned again in the notes on March 6.

In May of 2005, heavy rains and snowmelt on top of saturated ground caused widespread flooding in the western and west-central portions of the county. No injury or loss of life was reported, but basements were flooded in Roberts and Joliet, roads and culverts were affected, and some areas were scoured.

There have been two Federal Disaster Declarations for flooding in Carbon County since 1974. Just under \$4 million dollars in federal assistance was provided for flooding in 1978 that occurred in 8 counties including Carbon County. Almost \$8 million was provided by local, state, and federal governments for flooding in 1997 covering 22 counties and one reservation including Carbon County. The SHELDUS data base has seven flood entries for Carbon County for the years 1969, 1971, 1972, 1989, 1990 (2), and 1994. The total property damage from the events in the SHELDUS data base was \$29,875 and the crop damages were \$896,424.



Vulnerability

Based upon discussion at the December 9, 2004 meeting, the PDM Steering Committee believes that Carbon County is not particularly vulnerable to flooding. This position is based upon the severity of previous floods, and the relatively limited amount of property and infrastructure located in the floodplains of the Clarks Fork and Rock Creek Rivers, the primary waterways in the county. Exceptions to this general position include several short stretches of the Clarks Fork River between Bridger and Fromberg that are subject to winter ice jam flooding and a small section of Rock Creek where it passes next to Joliet. A bridge that carries not only traffic, but communications infrastructure crosses Rock Creek east of Joliet. To the best recollections of the Steering Committee members and others present for the discussion, previous flash floods, with few exceptions, have caused minimal damage and occurred only at great intervals.

All involved in the preparation of this plan are in agreement that the most serious flood risk in the county occurs when high seasonal runoff, rapid snowmelt due to warm temperatures, and a heavy, prolonged precipitation event occur at the same time. History in the county bears out that these events have generally been the costliest in terms of damage to and loss of property and livestock.

Portions of Red Lodge and Joliet are located within the 100-year floodplain of Rock Creek, and portions of Bridger and Fromberg are located in the 100-year floodplain of the Clarks Fork River. Granitic soils in the southern end of the county are quite porous, but soils throughout the county have the possibility of becoming saturated as occurred in May 2005. Basement flooding and minor scouring occurred in Roberts, Joliet, and Red Lodge when rain and snow fell on already-saturated ground. This combination of circumstances could occur again in any part of the county during the late spring and early summer months.

Damage of structures is likely during flooding. Flooding can wash away supporting fill, infiltrate basements, damage contents, and in worst cases wash structures off their foundations. The primary structures at risk from floods in the county are residences. Portions of the transportation infrastructure, county roads and culverts, and county and state highway bridges could be at risk as well. It is possible future development could be at risk from flooding, most likely flash flooding. No specific development has been proposed in any of the delineated floodplains at this time. Carbon County participates in the National Flood Insurance Program and regulates construction in the flood plain, but this does not provide a guarantee that future floods will not damage structures and/or infrastructure.

Hazardous Material Incident

Although Carbon County has no Interstate Highway, hazardous materials move within and through the county on state highways, on Burlington Northern Santa

Fe (BNSF) railroad tracks, and within pipelines. A variety of hazardous materials are used or transported in the county. Among those used locally are gasoline and oil, and weed spraying chemicals. The county is also traversed by oil and gas pipelines. These pipelines access production areas, provide local service and provide long distance transport. The largest of these lines pass through the Clarks Fork Valley.

Historic Occurrences

The Montana Department of Environmental Quality maintains records of hazardous material discharges and spills. The county has 12 active sites where hazardous materials are present. There is only one active generator in the county classified as large, the County Weed Control District in Joliet. The majority of hazardous waste created in the county is used oil. The National Response Center lists 21 spills from 1991 through 2005. The types of spills include fixed (11), pipeline (7), mobile, (1), railroad (1), and storage tank (1.) ([Http://www.nrc.uscg.mil.wdbcgi/wdbcgi.exe](http://www.nrc.uscg.mil.wdbcgi/wdbcgi.exe))

Vulnerability

The county is vulnerable to a hazardous material incident by simple virtue of the presence of the hazardous materials. However, the amounts of waste generated and stored within the county are small and the materials not particularly toxic. According to the State of Montana Multi-Hazard Mitigation Plan and Statewide Hazard Assessment, Carbon County has a low vulnerability. There are, however, two scenarios in which major incidents could occur in the county. The first would involve a pipeline rupture creating an extensive oil spill. The other possibility, and the one analyzed later in this chapter with respect to potential for damage would involve a railroad accident with hazardous material spill. Vehicle hazardous material spills are most likely to occur along the major highways, 212, 310, and 78. These highways pass through each of the communities in the county. Hazardous material spills are unlikely to directly affect structures or infrastructure.

Human and Animal Disease

An outbreak of disease in either the human or the animal population in the county is of vital concern because diseases cause morbidity (illness) and/or mortality. Consequences in terms of loss of life and economic impacts can be severe. Depending on the illness, method of detection, gestation period, and rate of spread, many people can be affected by the time an outbreak has been detected. There is currently no functioning mechanism in place for communication about diseases between the public health department, county health care providers, and animal health specialists in the county.



New calves near Boyd, spring 2005

The following diseases are either present in Carbon County now, have occurred in the past, or could occur in the future.

Table 3.3. Carbon County Human Disease Vulnerability

<i>Disease</i>	<i>Human/ Animal</i>	<i>Transmission</i>	<i>Present Currently</i>	<i>Present Historically</i>	<i>Potential</i>
Influenza	H	Air-borne	X	X	X
Pertussis	H	Air-borne		X	X
SARS	H	Air-borne			X
Hanta Virus	H	Air-borne		X	X
Tuberculosis	H	Air-borne		X	X
Small Pox	H	Air-borne		X	X
Anthrax	H,A	Air-borne			X
Hepatitis B, C	H	Blood-borne, Bodily fluids	X	X	X
HIV-Aids	H	Bodily fluids	X	X	X
Sexually transmitted diseases	H	Bodily fluids	X	X	X
Hepatitis A	H	Food-borne	X	X	X
Salmonella	H	Food-borne	X	X	X
E.Coli	H	Food-borne		X	X
Bubonic plague	H,A	Vector-borne	X-animal	X	X
West Nile Virus	H, A	Vector-borne		X	X
Cryptosporidia	H	Water-borne	X	X	X
Giardia	H	Water-borne		X	X
Rabies	H,A	Zoonotic		X	X
Camphelobacter	H	Zoonotic	X	X	X

Table 3.4. Existing and Potential Wildlife Diseases

<i>Disease</i>	<i>Species</i>	<i>Currently Present in Montana</i>	<i>Implications for Human Health</i>
Brucellosis	Bison, elk, cattle	Yes	Undulant fever in humans
Bubonic Plague	Rodents	Yes	Yes
Chronic Wasting Disease	Ungulates	No	None known (FWP developing plan to handle eventual outbreak)
Hanta virus	Deer mice	Yes	Yes
Lyme Disease	Wood Ticks	No	Yes
Rabies	Bats, mammals	Yes	Yes
Rocky Mountain Spotted Fever	Wood Ticks	Yes	Yes
Tuberculosis	Ungulates	No	Yes
Tularemia	Arthropods (rabbits)	Yes	Yes
West Nile Virus	Mosquitoes	Yes	Yes

Source: Neil Anderson, Wildlife Lab Supervisor, Montana Fish, Wildlife and Parks

Historic Occurrences

Human disease records are confidential. According to County Public Health Nurse, Linda Stewart, good historical data on diseases in the county is not available due to poor reporting. No widespread outbreaks of any of the diseases listed above have occurred in recent memory. Those diseases that have occurred in Carbon County are shown in the above table. A small number of past cases of rabies have resulted in short-term quarantines of the county.

Vulnerability

Different diseases are spread by different means, air-borne, food-borne, blood-borne, vector-borne, and water-borne. Vulnerability of the human population or animal population to any given disease will depend on its presence within or in proximity to the county, detection and reporting, and the method and rate of spread.

Carbon County residents are likely to experience cases of one or more of the diseases listed due to existing situation described below. Residents of Carbon County travel widely, within the state, the country, and around the globe. During these travels, it is possible for residents to come into contact with pathogens and bring them back to the county. And, tourists from around the world visit Carbon County, potentially bringing with them a variety of pathogenic agents.

Individuals with undeveloped or weakened immune systems for example, young children, elderly, or those ill with chronic conditions are particularly vulnerable to communicable diseases. Many county residents are engaged in outdoor occupations such as farming and ranching. These individuals may be more likely to come into contact with Hanta virus, West Nile Virus, plague, and/or viruses from livestock. Outdoor recreationists can be at increased risk of contracting spotted fever, Lyme disease, and giardia.

Carbon County is home to a variety of wildlife species. Many residents in the county fish, hunt big game and birds, and some individuals trap fur-bearing animals. Residents of other counties in Montana and other states visit Carbon County to view and hunt the wildlife here. In addition to the diseases listed above that one can come into contact with in the out of doors, close contact with wildlife can expose individuals to rabies and tularemia. Residents and visitors to the county could be exposed to these diseases in any part of the county. Disease incidents would not directly affect structures or infrastructure. Critical facilities would be involved in response, but not compromised.

Severe Weather

“Although severe storms are not common, hailstorms, high winds, heavy snows, freezing rain and sleet, and small tornadoes have been observed at intervals of several years somewhere in the Carbon County Area.” (Carbon County Soil Survey, USDA, 1975)

The Western Region Climate Center has records for storm events for Carbon County dating to January 1, 1950. Very little data was entered prior to 1973. The data is summarized below by storm type.

Table 3.5. Severe Weather in Carbon County

<i>Storm Type</i>	<i>Date</i>	<i>Location</i>
Floods	1997	Bridger
	2001	Joliet
Hail	1999	Belfry
	1999, 2001 (2)	Boyd
	1996, 2001	Bridger
	1957, 1958, 1975 (2), 1979, 1980, 1982, 1985, 1986, 1991, 1992, 1995	Carbon County- unspecified
	1994	Edgar
	1998, 1999, 2001	Fromberg
	1999, 2000, 2001(3)	Joliet
	1996, 1999	Red Lodge
<i>Storm Type</i>	<i>Date</i>	<i>Location</i>
	1996, 1998	Rockvale
	1999	Roberts

	1996, 2001	Roscoe
	2001 (2), 2003	Silesia
Heavy Rain	2001	Bridger
	2001	Joliet
Thunderstorm/Wind	1973, 1975, 1979, 1982	Carbon County- unspecified
	1998	Boyd
	1999	Bridger
	1997, 2001 (2)	Joliet
	1994	Red Lodge
	2000 (2)	Warren
Tornado	1988, 1990, 1991	Carbon County- unspecified

Note: Above data includes; all weather events from 1993-1995 (except 6/93-7/93) as entered into the National Climate Data Center's "Storm Data", all weather events from 1996 as entered into Storm Data, and additional data from the Storm Prediction Center including tornadoes 1950-1992, thunderstorm winds 1955-1992, and hail 1955-1992.

Hail, Severe Thunderstorms

Hail is a frequent occurrence in Carbon County. Depending on the size of the hail and the seasonal timing of the storm, hail can cause crop damage, property damage, vehicle accidents, and personal injury. Thunderstorms are common as well and are often accompanied by strong winds and electrical activity. These types of storms generally occur from May through September.

Historic Occurrences

Gilbert Brown of Bridger remembered an extreme localized hail storm in June of 1957. Although the storm lasted only 30 minutes, he recalled that windows were broken in his house, shingles were torn from the roof, and the wheat crop was knocked down. The storm moved from the northwest to the southeast damaging a narrow swath. Interviews with other long-time residents did not yield recollections of severe summer storms.

Thirty-six hail events and a total of 54 hail and thunderstorm events have been recorded in the county in Storm Data since 1950. More storms may have gone unrecorded. The state PDM plan reports that Carbon County has experienced four to seven hailstorms with hail greater than two inches in diameter since 1950. Hail storms are very frequent events in the county that are usually localized and short-lasting. The SHELATUS data shows seven records for hail and severe thunderstorms during the years 1961(2), 1968, 1975, 1982, 1986, and 1991. Total property and crop damages from these storms were \$55,442 and \$178,169 respectively.

Vulnerability

All areas of the county are potentially vulnerable to severe thunderstorms and hail events. The Soil Survey published by the Soil Conservation Service reports that “Hail of damaging strength or size occurs about 1 year in 10 at lower elevations.” Severe summer storms can cause a variety of damage. Hail and high winds can damage crops, structures, vehicles, landscaped vegetation, and stands of timber. Lightning can cause structural damage, fires, and damage to structural contents such as appliances. Heavy precipitation can also cause structural damage. Human and animal deaths have in the past and could in the future result from severe summer storms.

Winter storms

Blizzards and ice storms occur in Carbon County. A blizzard is defined as a storm with winds over 35 miles per hour with snow and blowing snow reducing visibility to near zero. Blizzards and ice storms pose a great threat to human life, livestock, and wildlife in Carbon County, and in Montana. Winter storms can cause deaths to occur through hypothermia, vehicle accidents, and over-exertion. As evidenced by the failure to recall severe winter storms, residents of the county are accustomed to dealing with winter storms. However, rapid snowfall, extremely low temperatures, and/or strong winds can combine to present especially dangerous conditions.



Highway 212 through Red Lodge, December 2004

Historic Occurrences

Beartooth Times February 13, 1936 headlines read “Old Man Winter Still in Control.” “The present spell now well into its third week, is the most severe experienced in the state in several years.” Snowfall was heavy and temperatures were well below zero. “The coldest registered in Bridger was 32 below zero, with many readings from 26-30 below.” The Carbon County News reported the following week that “game birds were dying from the cold snap” due to sub-zero temperatures and deep snow. (February 19, 1936) Reuben Steinmetz recalled riding his horse from Montauqua to Rockvale in the storm and freezing his face in the cold. He reported that numbers of wildlife succumbed to the cold temperatures.

Long-time resident, Bob Moran, recalled a heavy snow in the 1940’s that crushed the roof on the Bull and Bear in downtown Red Lodge. Jim Yedlicka in the Clarks Fork Valley recalled that there were a number of winter storms in the 1940s that caused power outages. The Carbon County News reported on a number of severe winter weather events in 1949. First, January 1949 was the coldest since 1937. Second, the News reported “High Wind Hits Red Lodge Area.” The February 10th edition reported that a warm wind from the south melted snow and left glazed sidewalks, stalled cars, a bus and trucks blown into ditches, and snow drifts that made the roads impassable. Just a week later the News again reported that wind and snow had caused 250 miles of road in the north end of the county to be blocked by drifts.

In April of 1955 Carbon County News reported that “Carbon County is Snowbound for Two Days. (April 7, 1955) The article further stated that streets and roads were being reopened and “little serious hardship was reported.” This despite the fact that there was an 8 foot snowdrift across Highway 212 one mile south of Red Lodge and roads throughout the county were blocked. “Some farmers expected lambing and calving losses, and few were caught with a short supply of feed.” Drifts on the Washoe Hill were 8-10 feet, cars were stranded, people were marooned, schools closed, drill rigs shut down, funerals postponed, a greenhouse was damaged, the telephone exchange was swamped with calls, and there was power failure throughout Red Lodge. The article concluded that “There were few reports of acute suffering, although there were tales of heroism as in any disaster.” Howard Brown recalled losing stock, lambs, that winter and also losing power. “The whole county was blanketed, Rockvale got 48 inches and the roads in the Clarks Fork Valley were all closed.” Reuben Steinmetz recollected four feet of snow at Silesia. With the road to Red Lodge closed, people stayed at Fort Rockvale. The snow came for three days solid and produced huge drifts. Calves were lost.

An ice storm in the late 1960's knocked out power to the town of Fromberg for four days. Rural areas were without power for 5 to 6 days. Heavy ice-coated power lines went down and even broke the power poles off according to rancher, Jim Yedlicka.

According to the Carbon County News on January 20, 1972, the blizzard of 1972 created power outages, buried fire hydrants in Red Lodge, and caused a myriad of vehicle accidents due to poor visibility. Red Lodge was nicknamed "White Lodge" during the winter of 1971-72 as a result of a series of major winter storms that swept through one after the other. The News reported on February 3 and 17 that snowfall in Red Lodge in January was 62.5 inches and the snow depth was 180% of average. According to the Soil Conservation Service, water content of the snow was 207% of average. An April storm in 1973, reported in the April 26, 1973 Carbon County News, knocked down utility poles between Billings and Joliet by the hundreds and dumped drifts of six feet in Red Lodge. The utility companies struggled to respond, but the ski area enjoyed an extra three days of skiing.

January 1984 produced a storm with record snowfall, 73 inches in one storm, according to former County Commissioner, Frank Cole. "We had winters, winters, winters. People couldn't get to their haystacks, ran out of fuel, and we had to deliver fuel."

Vulnerability

Although there have been no recent state or federal disaster declarations for winter storms for Carbon County, the entire county remains vulnerable to winter storms due to the continental weather patterns. The extent of impact or damage will vary with major winter storm events dependent upon the amount and moisture content of snow, wind speeds, temperature ranges, and the duration of the event. Potential loss calculations found later in the chapter show that even moderate winter storms can have significant economic impact. Humans, livestock, structures, and vegetation are all at risk of damage from winter storms.

Tornadoes

Tornadoes are infrequent, but not unheard-of events in Carbon County. A tornado is a violently rotating column of air in contact with the ground. Tornadoes usually occur at the base of thunderstorms. According to the state PDM plan, most tornadoes in Montana occur during the month of June, followed closely by July. Tornadoes have caused fatalities, crop and property damage in Montana in the past.

Historic Occurrences

Between 1950 and 2003, Carbon County had 2-5 tornadoes spotted that were reported. (State of Montana Multi-Hazard Mitigation Plan and Statewide Assessment, November 2004.) There have no doubt been additional tornadoes present in the county that were not formally reported. The storm data in Figure III- show tornadoes in the county in three years, 1988, 1990, and 1991. The tornado project also lists tornadoes for the county in 1988 and 1990. (www.tornadoproject.com)

Vulnerability

Based upon past high wind events researched for the state PDM plan, Carbon County is not in the top 10 Montana counties for vulnerability to tornadoes. The composite frequency of a damaging wind/hail event for Carbon County is less than 100% meaning that the county is unlikely to experience one of these events annually. However, strong wind events are common and all areas of the county are at risk for experiencing high wind events. Structures are at risk from tornadoes. Tornadoes can cause roof, window, and structural damage and in rare cases can demolish buildings and/or lift them off their foundations.

Volcanic Activity

According to the U.S. Geological Survey, Yellowstone National Park has been identified as a prominent hot spot for geologic activity. The hot spot is presumed to exist under the continental crust in the region of Yellowstone National Park and northwestern Wyoming. Large calderas under the park were produced by three gigantic eruptions during the past 2 million years, the most recent of which was approximately 600,000 years ago. That particular volcanic eruption blasted molten rock into the air at 1,000 times the volume of the 1980 Mount St. Helen's eruption subsequently collapsing to create the Yellowstone Caldera (Tracking Changes in Yellowstone's Restless Volcanic System, U.S. G.S. Website). Ash deposits from these volcanic eruptions have been mapped in Iowa, Missouri, Texas, and northern Mexico. Thermal energy from the hot spots fuel hot pools, springs, geysers, and mud pots in the park today. "Recent surveys demonstrate that parts of the Yellowstone region rise and fall as much as 1 centimeter a year, indication the area is still geologically restless. However, these measurable ground movements, which most likely reflect hydrothermal pressure changes, do not necessarily signal renewed volcanic activity in the area." (Kious, Jacqueline and Robert Tilling, The Dynamic Earth: The Story of Plate Tectonics, USGS website)

Historic Occurrences

Since the late 1700's, volcanic eruptions in the continental United States have occurred in Oregon, Washington, and California. The most recent volcanic

activity in the Yellowstone region occurred 70,000 years ago in the form of a lava flow. One incidence of volcanic ash fallout has occurred in the county in recent times. That incident occurred with the eruption of Mount St. Helens in 1980. The Carbon County News reported on May 22, 1980, that the sky appeared to be foggy and a thin layer of gritty, dull, grey powder was deposited.

Vulnerability

The Yellowstone Volcano Observatory was created in 2001 by the U.S. Geological Survey to strengthen scientists' ability to track activity that could result in hazardous seismic, hydrothermal, or volcanic events in the region. Benchmarks from 1923 are being re-surveyed and ground movements are being tracked using new satellite-based methods. According to the U.S.G.S. future consequences of volcanic activity in the Park could include destructive earthquakes, hydrothermal explosions, and volcanic eruptions. By monitoring geologic activity, scientists hope to forecast when hot pressurized fluids or molten rock moving beneath Yellowstone will erupt at the surface, but scientists are unable at this time to predict the likelihood of this event from happening. All areas of the county would be affected by a volcanic eruption of the Yellowstone caldera. If a large volcanic eruption were to occur, structures would almost certainly be damaged along with potentially significant loss of life.

Wildland Fires

Chapter 6 of this plan contains an extensive discussion on wildland fire history and vulnerability of Carbon County to the wildland fire hazard.

Critical Facilities, Local Government

Table 3.6. Bear Creek, Town of

<i>Name</i>	<i>Square Feet</i>	<i>Constr. Date</i>	<i>Households</i>	<i>Estimated CRV</i>
Town Hall	1989	Pre-1950	N/A	\$ 26,850
Fire Station	961	1990	N/A	\$ 12,970
Sewer Plant	N/A	1989	75	\$ 4 million
Water Plant	N/A	1966/2002	75	\$ 4 million

Source: City Clerk, Jane Swanson Webb, CRV is current replacement value

Table 3.7. Belfry Infrastructure-unincorporated

<i>Name</i>	<i>Construction Date</i>	<i>Households Served</i>	<i>Estimated CRV</i>
Belfry Sewer	1969	141	Not available
Belfry Water	1976	141	Not available

Sources: Sam Krum, Belfry Sewer and Water District

Table 3.8. Bridger, Town of

<i>Name</i>	<i>Location</i>	<i>SF</i>	<i>Year Built</i>	<i>Value</i>
Civic Center	210 S. Main Street	4784	1942	\$ 323,494
Fire House #1	212A S. C Street	1616	1975	\$ 67,071
Fire House #2	212B S. C Street	3200	1975	\$ 120,064
New Town Shop	300 E Carbon	2400	2001	\$ 95,736
Pump House #3	E. Carbon Street	374	1953	\$ 17,123
Sewer Blower Bldg	E. of F Street	72	1991	\$ 34,461
Lagoon Ponds	E. of F Street	N/A	1991	\$ 715,000
Water Tower	W. of Town	N/A	1977	\$ 175,000
Pump House #1	S. B Street	320	1942	\$ 11,887
Pump House #2	S. B Street	672	1945	\$ 19,553

Source: Driver Alliant Insurance Services property schedule provided by the Town of Bridger (January 14, 2004.)

Table 3.9. Edgar, Unincorporated

<i>Name</i>	<i>Households Served</i>	<i>Construction Date</i>	<i>Estimated CRV</i>
Sewer System	115	1959	\$3,000,000

Source: Karen Ulrichson, Edgar Sewer Board

Table 3.10. Fromberg, Town of

<i>Name</i>	<i>Households Served</i>	<i>Insurance limit</i>	<i>Estimated CRV</i>
Sewer System	219	N/A	\$6,000,000
Town Hall	N/A	\$ 41,000	
Town Shop	N/A	\$ 28,500	
Water Plant and pump house	217	N/A	\$ 7,500,000

Sources: Town Clerk, Tracy McNeely, Town Public Works Director, Mike McNeely, Continental Western Group, Beartooth Insurance



Joliet Town Hall

Table 3.11. Joliet, Town of

<i>Name</i>	<i>Square Feet</i>	<i>Construction Date</i>	<i>Households Served</i>	<i>Structure Replacement Estimate</i>
Community Center	10,000	2004	N/A	\$1,000,000
EMS building	2,000	2003	N/A	
Fire Station and pump house	2,600	1975, 1965	N/A	\$325,500
Town Hall	1,500	1935	N/A	\$ 183,424
Town Shop	1,400	1950	N/A	\$ 63,246
Sewer Buildings, Pumps, Lagoons	N/A	1986	285	\$568,544
Water Pumps, Wells	N/A	Various	285	\$188,500

Source: Charlie Beuchler, Public Works Director, Ambulance Service, Bank of Joliet.

Table 3.12. Red Lodge, City of

<i>Name</i>	<i>Location</i>	<i>SF</i>	<i>Year</i>	<i>Contents</i>	<i>Structure</i>
City Hall	1 S. Platt	3500	1920	\$ 55,000	\$290,000
Water Works Building	2 mi S of city		1985	\$ 250,000	\$210,000
Water Works Maint. Bldg	W.Fork Rock Cr.	600	2000	\$ 10,000	\$ 35,000
Pump House		400	1960	\$ 35,000	\$ 26,000
Offices	3 rd S. Platt	2400	1978	\$ 20,000	\$165,000
Garage/Shop	S of City Hwy 212	2000	1970 1999	\$ 40,000	\$115,000
Rural Fire Hall	Hwy 212		1980	\$ 20,000	\$182,000
Sewer Treatment Building #1	N of City	1200		\$ 100,000	\$ 70,000
ST Bldg #2	N of City	480		\$ 50,000	\$ 35,000

Source: Debbie Tomicich, City Clerk

Table 3.13. Roberts-Unincorporated

<i>Name</i>	<i>Households Served</i>	<i>Construction Year</i>	<i>Estimated Current Replacement Value</i>
Sewer System	125	1996	\$2,500,000
Water System	125	1980	\$1,500,000

Sources: Paulette Puchin, Bruce McKee (McKee Engineering)



Carbon County Administration Building

Table 3.14. Carbon County Buildings over \$100,000

<i>Name</i>	<i>Location</i>	<i>Appraised Value Contents</i>	<i>Appraised Value Building</i>
Court House	Red Lodge	\$ 219,000	\$ 1,610,347
Administration Bldg	Red Lodge	\$ 265,878	\$ 1,124,819
Courthouse Annex	Red Lodge	\$ 376,210	\$ 1,280,685
Bridger Shop	Bridger	\$ 125,000	\$ 275,000
Joliet Office	Joliet	\$ 129,406	\$ 485,500
Red Lodge Shop	Red Lodge	\$ 172,753	\$ 217,087
Red Lodge Rural Fire Department	Red Lodge	\$ 100,000	\$ 700,000
Belfry Rural Fire Department	Belfry	\$ 94,288	\$ 147,416

Source: Tom Kastelitz, Beartooth Insurance Agency.

Critical State Facilities

Table 3.15. State of Montana Assets in Carbon County

<i>Name</i>	<i>Square Feet</i>	<i>Insured value of buildings</i>
DOT-Bridger Shop	4136	\$ 149,020
DOT-Red Lodge Shop buildings (4)	36, 480 2400, 3520	\$ 245,109 (total)

Source: Larry Murolo, Montana DOT. Building contents (heavy equipment) are self-insured. The 36 SF communications building equipment is insured for \$9000. Replacement value for the shop structures is \$40-45/square foot.

Critical Federal Facilities

Table 3.16. Federal and Federal Occupied Facilities in Carbon County

<i>Facility Name</i>	<i>SF</i>	<i>Estimated CRV</i>
Bear Creek Post Office	480	\$ 58,050
Belfry Post Office	2125	\$ 268,875
Bridger Post Office	2342	\$ 316,170
Edgar Post Office	520	\$ 70,200
Fromberg Post Office	1220	\$ 164,700
Joliet Post Office	3447	\$ 465,345
Red Lodge Post Office	9432	\$1,273,320
Red Lodge Forest Service Office	6704	\$1,743,000
Red Lodge Forest Service Warehouse	2974	\$ 480,000
Roberts Post Office	3153	\$ 425,655
Roscoe Post Office	915	\$ 123,525
USDA Service Center-FSA, NRCS, CD	4400	\$ 450,000
USDA Service Center-RC&D	1500	\$ 175,000

Sources:

- 1) Postal Service values were obtained using an average of \$135 per square foot. This figure was provided by the U.S. Postal Service (Denver office) and is the average based on new construction of owned buildings using standard plans. The actual replacement cost of any specific post office would vary slightly.
- 2) Forest Service values were obtained from Jeff Stockwell, Facility Manager. (Replacement costs for the office and warehouse are \$260 and \$160/square foot respectively.)
- 3) USDA values were obtained from the two buildings owners', Stan Todd, and Gail Stevens.

Vulnerable Populations

Table 3.17. Schools in Carbon County

<i>Name</i>	<i>Enrollment</i>	<i>Square feet</i>	<i>Construction Date</i>	<i>Current Replacement Value</i>
Belfry Elem. and H.S, K-12	89		1963, 1930's	\$3,261,400
Boyd (2 buildings)	10	2,250	1900,1910	\$ 350,000
Bridger Elementary	108	23,572	1968	\$3,276,000
Bridger H.S.	72	24,140	1956	\$2,675,000
Edgar Elementary	9	4,536	1956	\$517,000
Fromberg Kindergarden	8	1,500	1990	\$ 90,000
Fromberg Elementary	81	7,756	1955	\$ 965,000
Fromberg H.S.	81	9,350	1930	\$1,949,000
Fromberg Gym	N/A	9,200	1969/1998	\$1,152,000
Joliet Public School K-12	385	75,322	1908	\$7,764,000
Luther Elem. (2 bldgs) K-8	40	3,314	1920	\$ 298,000
RL Civic Center	N/A	13,900	1950	\$1,220,000
Red Lodge Mtn View Elementary	130	17,100	1950	\$1,454,000
Red Lodge Roosevelt Elem.	209	13,650	1920 1989 addition	\$2,488,000
Red Lodge H.S.	170	27,890	1960	\$2,371,000
Red Lodge H.S. Shop addition		8,672	1983	\$ 737,000
Red Lodge H.S. Modular	N/A	18,046	1994	\$ 157,000
Roberts K-12	141	29,000	1920/1990/2002	\$3,650,000

Source: School clerks, principals, superintendents, Beartooth Insurance, Bernie Fisher, State Department of Labor) Latest available figures, 12/ 2004.

Table 3.18. Health Care Facilities

<i>Name</i>	<i>Location</i>	<i>Licensed beds</i>	<i>Square Feet</i>	<i>Const. Date</i>	<i>Current Replacement Value</i>
Beartooth Hospital and Health Center	White St. Red Lodge	35	40,000	1950	\$20,000,000
Beartooth Industries GroupHome	223 East Cooper St. Red Lodge	8	4,200	1980	\$ 270,000
Beartooth Industries GroupHome	1002 White St. Red Lodge	8	4,200	1980	\$ 310,000
Cedar Wood Villa Nursing Home	1 S. Oakes Red Lodge	43	22,000	1973	\$ 750,000
Tendernest Assisted Living (estimate)	215 North Cooper St. Red Lodge	8-11	5,000	1998	\$ 350,000

Sources: Facility Managers

Potential Loss Estimates

Methodology

To develop potential loss estimates, a specific disaster event has been postulated for each type of disaster ranked as a priority by the public and Steering Committee. The disasters postulated are in the cases of the flood, wind, and winter storm events, similar to recent historic disasters of those types. Rock and mud slide costs are taken from preliminary estimates for repair of damage to the Beartooth Highway as a result of the May 2005 slides. The Hazmat incident was developed to explore a short-term railroad incident requiring an evacuation. The scenario of the human/animal disease incident was developed as one of the most likely disasters that could occur, but certainly not the most devastating one possible. Reasonably foreseeable consequences were identified for each of the events and then experts on costs for the consequences were contacted for dollar estimates based on previous local experiences.

Earth Movement

Most rock slides that occur in the county are small and localized. Associated costs are generally limited to clean-up which would involve heavy equipment and personnel for short periods of time. The dollar range for dealing with the more common rock slides ranges from several hundred to several thousand dollars.

In the case of the spring 2005 slides on the Beartooth Highway, however, costs will be significant. Early estimates for road repair alone are at or above \$20 million. This cost does not address business interruption and loss. For example the closing of the ski camp on top of the pass during the summer of 2005 will result in the loss of the rental of 200 rooms in the city of Red Lodge. According to the President of the Merchants Association, Judy Toler, "The effect the road closure will have on businesses in Red Lodge is hard to predict." (Billings Gazette, May 25, 2005) Chamber member, Art Maxwell, commented "It's going to affect (local businesses) a whole lot, but we're trying to convince people that this is still a neat little community." Construction activities are expected to replace some of the revenue that will be lost by the reduced tourist trade.

Flood

Carbon County, the city of Red Lodge, the towns of Bridger, Fromberg, and Joliet participate in the National Flood Insurance Program. The communities of Bridger, Fromberg, and Red Lodge have been notified that additional flood plain studies are planned by FEMA. These communities all plan to participate in the proposed studies.

Carbon County has two primary waterways, the Clarks Fork of the Yellowstone River and Rock Creek. These two river valleys are also the location of the most

residential and commercial development in the county, and contain the majority of the public and private infrastructure as well. Flooding along either of these rivers would create the most damage. For purposes of estimating damages for this plan, the following event is postulated.

The time of year is late May, just prior to peak stream runoff from snowmelt. Rock Creek is running high, but not bank-full. On top of the seasonal runoff, a 24-hour precipitation event occurs, dropping 4 inches of warm rain. This rain adds to the runoff already in progress plus it speeds the snowmelt. The result is a 100-year flood through the City of Red Lodge, Town of Joliet, and rural properties in between. The damages that could be expected are shown below.

Table 3.19. 100-Year Rock Creek Flood Damage Loss Estimate

<i>Impact</i>	<i>Comments</i>	<i>Number</i>	<i>Cost per</i>	<i>Total Cost</i>
Embankment protection	Riprap and bank stabilization Red Lodge area	.5-1 mile	\$ 250-500,000	\$ 500,000
Residential Structures – Foundation Damage	Red Lodge (3) Joliet (3) Rural (2)	8	25% of 8 @ \$125,000	\$ 250,000
City of Red Lodge infrastructure damage	6-8 th Streets	2 blocks	\$ 20,000	\$ 40,000
Debris Clean-up	Red Lodge and Joliet		\$ 15,000	\$ 15,000
Town of Joliet infrastructure damage	Creek pump house	1	\$ 3,500	\$ 3,500
			Total Cost	\$ 808,500

Sources: Red Lodge, Joliet Public Works Directors, Beartooth Insurance

Hazmat Incident

Carbon County has no Interstate Highway. Hazardous materials move through the county primarily on railroad cars and a small number of trucks. Likely scenarios for minor spills would be inadvertent discharge of small amounts of motor oil and/or weed spraying chemicals. The most likely scenario for a railroad hazardous material incident would be a train derailment and subsequent spill in the Clarks Fork Valley.

For purposes of this estimate, a 20-car train derailment between Edgar and Fromberg is postulated. Evacuation of Edgar area for 24 hours is required. No hazardous material reaches the Clarks Fork River.

Table 3.20. Direct Cost Estimate for Hazmat Incident

<i>Impact</i>	<i>Comments</i>	<i>Cost</i>
Hazardous material cleanup	Hazmat Team for containment and clean-up Hazmat vehicle @ \$150/hr x 48 hr 6-person Pod @ \$300/hr x 48 hr Suits 6 x \$1000 Fuel	\$ 30,000
Security, evacuations, and traffic control	The Fire Department and county law enforcement are involved in Initial assessment, barricading and securing the area, diverting traffic, and conducting evacuations (10 employees for 48 hours @ \$25 plus fuel)	\$ 15,000
Sheltering	200 people for 24 hours	\$ 7,075
Medical	2 people treated for skin irritations, 4 people checked for respiratory exposure	\$ 1,000
	TOTAL COST	\$ 53,075

Sources: Carbon County Sheriff, Billings Police Department, American Red Cross

Human and Animal Disease

Estimating potential losses for disease incidents is extremely difficult due to the variability of potential situations. For example, a small number of cases of a human disease may have minor economic impact while a large number of cases of a human or domestic animal disease could have a large economic impact especially if the county were to be quarantined for any length of time. If an outbreak occurred in a big game species, economic impacts would be felt in the recreation sector. Costs associated with disease are for both morbidity (sickness) and mortality (death.) Lost lives, whether they be human, domestic stock, or wildlife can be costly.

For purposes of estimating loss for this plan, the following incident is analyzed: one hundred cases of influenza are diagnosed in Carbon County over a four-month period.

Table 3.21. Potential Loss Estimate from a Human Disease Incident

<i>Impact</i>	<i>Number</i>	<i>Cost Per</i>	<i>Total Cost</i>
Business-absent employees 50 cases @ 5days	250 days	\$ 200	\$50,000
BHHC Overnight stays, 2 days ea	10	\$ 1500	\$30,000
BHHC ER visits	15	\$ 750	\$11,250
Clinic Visits-initial and follow- up	150	\$ 50	\$ 7,500
Prescription medications	75	\$ 75	\$ 5,625
Ambulance runs (to Billings)	2	\$ 1200	\$ 2,400
Ambulance runs (local)	4	\$ 500	\$ 2,000
Daycare absenteeism	50 days	\$ 25	\$ 1,250
OTC medications	50	\$ 20	\$ 1,000
		COST	\$ 111,025

Sources: Carbon County Public Health Department/Nurse, Red Lodge Ambulance, Beartooth Hospital and Health Center, Red Lodge Drug

Wildland Fire

Loss estimates for a wildland fire scenario are provided in Chapter V.

Wind Event

Carbon County experiences frequent wind events. Most of the wind events cause either no damage or only small amounts of damage. On occasion, however, higher winds are present and/or gusts reach high speeds. When this occurs, some property damage is likely and personal injury is also possible. Although tornadoes do occur in the county, they are not a frequent occurrence, may not reach the ground, and historically have caused very limited damage.

For purposes of this loss estimate, the following event is postulated. Fall winds across the entire county of 40 mph are sustained over a 24-hour period with gusts reaching 75 mph. No precipitation accompanies the wind storm.

Table 3.22. Potential Loss Estimate for Wind Event

<i>Impact</i>	<i>Comments</i>	<i>Number</i>	<i>Cost per</i>	<i>Total Cost</i>
Partial roof damage-residential	Some shingles are lost	25	\$ 2,500	\$ 62,500
Damage to transmission lines (scattered 6 to 8-hour outages)	Wire breaks, tree clearing, circuit re-closure, small number of pole replacements	1 storm	\$ 50,000	\$ 50,000
Complete roof loss-residential	Roof must be replaced	5	\$ 5,000	\$ 25,000
Damage to vegetation (5 acres blowdown on Natl Forest, resident veg. damaged)	Prep and removal of N.F. blowdown, removal and replacement of residential landscaping	1 storm	\$ 25,000	\$ 25,000
Personal Injury	Injuries caused by flying debris and strains from clean-up	5	\$ 150	\$ 750
			COST	\$ 163,250

Sources: Beartooth Insurance, Beartooth Electric, Custer National Forest

Winter Storm

Winter storms can come over many months and display different characteristics related to amount of snowfall and/or ice, wind speeds, temperature ranges, and amount of water in snow that falls. Depending on the characteristics of any individual event, there will be different impacts and losses.

For the purposes of developing this loss estimate, one event with the following specific characteristics is postulated. The event is a late winter storm with heavy snowfall occurring widely across the south half of the county. Snowfall reaches over six feet in the southern-most mountains, three feet in the foothills and at Red Lodge, tapers to one foot at Joliet, and is six inches or less across the rest of the county. Due to the lateness in the season, the snow has high moisture content. The snow is accompanied by moderate winds. Temperatures are only slightly below freezing so that ice also forms on power lines and some pavement underneath the snow. The storm lasts for two days.

Storms similar to this occurred in April of 2003 and May of 2005. Many of the costs estimated in the following table are based upon the 2003 storm experience. Impacts that could be reasonably foreseen from such an event include the

following. Additional losses that are difficult to quantify would result from retail business interruption.

Table 3.23. Economic Impacts of Late Winter Storm

<i>Impact</i>	<i>Number</i>	<i>Cost/Occurr.</i>	<i>Comments</i>	<i>Total Cost</i>
Damage to utility lines	1 storm	\$ 500,000	Dispatch, crews (Based on 2003)	\$ 500,000
Lost business Red Lodge Mtn	2000 Skier days	\$ 30/day ave	2 days blocked roads, no skiers	\$ 60,000
Structure damage	5 structures	\$ 7,500	Roof damage	\$ 37,500
Snow removal (2 passes) private property	700 accounts @ .75 hrs ea	\$ 60/hr	Residential and commercial property	\$ 31,500
Vehicle accidents	5 accidents (10 vehicles)	\$ 2,500/veh	Fender benders	\$ 25,000
Snow removal and sanding for county	1 storm	\$10,000/day	Personnel, equipment, fuel	\$ 20,000
Snow removal and sanding for Red Lodge	1 storm	\$ 15,000	Personnel equipment, fuel, sand (staffed equipment @ \$95/hr)	\$ 15,000
Snow removal and sanding, State of MT	1 storm	\$ 11,000	Personnel @ \$25/hr, equipment @ \$15/hr, sand @ \$12/yd, Deicer @ \$1/gall	\$ 11,000
Hospital Overnights	5 nights	\$ 1500	Broken hip	\$ 7,500
Doctor visits	10 visits	\$ 50	Strains, sprains, slips and falls	\$ 5,000
Veg. Damage	20 cases	\$ 250	Broken limbs	\$ 5,000
Hospital ER visits w/ x-ray, blood work	4 visits	\$ 750	Slips and falls, Strains	\$ 3,000
Snow removal and sanding for Joliet	1 storm	\$ 4,000	Personnel, equipment, fuel	\$ 3,000
Law Enforcement Calls	30 calls	\$ 75	Personnel time @ \$25/hr	\$ 2,250
Ambulance runs (local)	3 runs	\$ 500	Strains, falls	\$ 1,500
			TOTAL COST	\$727,250

Sources: Red Lodge, Carbon County, and, Joliet Public Works, Carbon County Sheriff, Treasurer, Commissioners, Beartooth Hospital, Red Lodge Ambulance, Beartooth Electric, Red Lodge Mountain, Red Lodge Area Chamber of Commerce, Blade Runner Snow Removal